# Canada's Forest Industry

**the next twenty years:** prospects & priorities

## Cost Projections

SIMONS Woodbridge, Reed & Associates
in association with Price Waterhouse

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# Cost Projections

December 1988

Prepared for:
Government of Canada
Canadian Forestry Service
Industry, Trade and
Technology Directorate
Economics Branch, Ottawa

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## VOLUME VI

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## PREFACE
## TO VOLUME VI

This volume presents key manufacturing costs and cost trends for a range of pulp and paper products.

As an integral part of the strategy assessment, its purpose is to assess the current competitive position of Canada's regions, compared with other supplying areas internationally, as well as examining prospects for 1995 and the Year 2010.

The analysis does not take into account capital or financing costs and should not be regarded as a 'stand-alone' volume. The reader is referred to Volume I for a dissertation of the implications of the analyses presented here and discussions of other factors affecting capital investment in the forest products industry.

## INTRODUCTION

The purpose of this volume is to review the competitiveness of selected grades of pulp and paper products[1] produced in Canada, with the same grades produced in other areas, from a cost perspective. Canada has enjoyed significant advantages over other countries in the past, particularly with respect to fibre and energy costs. These natural advantages made Canada a dominant producer and exporter of market pulp and newsprint. Nevertheless, Canada's position as a low cost supplier is being slowly eroded.

Over the last ten years there has been a significant expansion in pulp and paper manufacturing in other countries and Canada's market share has fallen or has not grown as fast as that of other producers. These expansions have left many Canadian mills behind in terms of manufacturing, process, quality control and emission control efficiencies. At the same time concerns are being raised over the longevity of our traditional major advantages - low fibre and energy costs.

The purpose of this volume is to look at each of the key cost elements--fibre, labour, energy and distribution and transportation, and assess Canada's present and likely future position through to the year 2010, on a comparative basis. By examining each of these elements and looking at the overall impact on a product by product basis, using simple models, we can determine which products are most likely to remain or become competitive, compared with trends in costs in other areas. In this way, and to the extent they are limited, resources can be channelled to have the greatest long-term benefit.

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[1] Wood products are not covered in the analysis. While the comparative advantage of the wood products sector will be similar in terms of cost elements, the relative competitiveness will not necessarily follow the same pattern as the pulp and paper sector due to a different mix of inputs and market structure.

The countries most likely to provide strong competition to Canada over the next 20 years or so are the United States, Brazil, Chile, Finland, the Iberian countries, Sweden and New Zealand. It is the costs and cost trends of these competing supply countries which are the subject of this analysis. However, unlike the others, the competition from Sweden and Finland will not be so much from a cost viewpoint as from the quality of their products and the technical excellence of their manufacturing processes. Furthermore, Japan has been included because its technological solutions are relevant to the analysis even though it is a very high cost producer.

Because of their size and for other reasons, Canada and the United States have been subdivided into regions as follows:

| Canada | United States |
|---|---|
| BC Coast | West Coast |
| BC Interior | Inland Empire |
| Prairies | North |
| Ontario | South |
| Quebec | |
| Atlantic Provinces | |

For each of these countries and regions we reviewed the undernoted cost elements:

| | |
|---|---|
| Fibre | Delivery - Western Europe |
| Filler/Coatings | Delivery - Japan |
| Labour | Delivery - US, Atlantic |
| Electric Power | |

We used 1987 costs as a base, but applied the exchange rates as at July 22, 1988. We then reviewed the likely trend in the individual cost elements. The years 1995 and 2010 were chosen as representative of the medium and longer terms. The trend was assessed from the viewpoint of becoming more or less competitive, Canada versus the subject country, with a factor of 1 assigned to "most competitive" and 10 to "least competitive".

We identified the main product groups to be the following (also see Glossary of Terms):

| | |
|---|---|
| BK Market Pulp | Newsprint |
| CTMP market pulp | Lightweight coated paper (LWC) |
| Supercalendered paper | Uncoated freesheet |
| Coated freesheet | Unbleached linerboard |
| White top liner | Solid Bleachboard (SBS) |

After completing the assessment of individual elements, we developed cost models for each of them. To do this we assigned weights to each constituent cost element according to each constituent's share of total product cost on average in 1987. Application of these weights to the unit costs permits a broad indication of how the individual products should fare over the next 20 years. This process is sufficiently simple that if there is a material change in the outlook for a particular cost element, such as energy, its impact on the major products can be quickly determined.

We have not taken into account, in this volume, two other market related factors which are important in assessing cost competitiveness from an international viewpoint. These factors are changes in foreign exchange rates and capital. The models have been developed using 1987 local costs translated at exchange rates at July 22, 1988. Nevertheless, exchange rates are constantly changing: For example, in the last year alone, the Canadian dollar has strengthened in excess of 10% as compared with the United States dollar.

Capital is important from several viewpoints. First, in terms of the amount of capital required to build or rebuild mills or major components; second and following from this, the associated interest or equity costs; third, the depreciation charge; and finally, sources of capital. For the purposes of the analysis in the following pages, we have not assumed any capital or other constraints. Consequently, this analysis does not differentiate between new greenfield and existing capacity.

Non-market factors clearly are also important considerations in assessing cost competitiveness. Volume I discusses the tendency of many areas to subsidize new or existing capital investments, wood costs and other factors. This occurs globally where public sector timber, tax or other financial concessions are used to achieve economic or social goals. These factors also are ignored intentionally in this part of the analysis.

The reader is referred, however, to Volume I (Section 2.1.2) where many of these factors are discussed. In Volume I, we combine the quantified, model-based analysis of existing and potential cost competitiveness presented here in Volume VI, with a brief qualitative assessment of other relevant factors.

For the purposes of the study our methodology is as described in the following extracts from Volume I.

"A large number of factors influence the competitiveness of a sawmill, pulp mill, paper machine, company, region or country. These include the fundamental cost factors, such as wood, labour, purchased energy and delivery. They also include product quality and service factors. In higher value added products, factors such as reliability of supply, consistency of product quality and others related to them frequently are important or even crucial in determining competitiveness. In this sense, there is an element of risk or cost to the purchaser if he buys simply on price alone. Few purchasers of higher valued products do so, and many sellers of commodity grades seek to differentiate their products from those of other producers in this way.

Consideration of fundamental costs, on a comparative basis, nevertheless, is a useful broad indicator of potential comparative advantage in trade. Clearly, overall competitiveness is determined by the aggregate impact of a wide range of factors, which vary widely between mills, companies, regions and countries. Moreover, the history and current practice in the development of forest industries in many parts of the world, show clearly that non-market factors frequently play a major role in achieving cost competitiveness of domestic capacity.

In recent years, the positive impacts of multi-lateral trade agreements, such as the various rounds of GATT, together with bi-lateral agreements, have done a great deal to produce "a level playing field". This has facilitated progress in achieving regional specialization based on fundamental cost factors. Nevertheless, the "playing field" still is far from level in many respects and is unlikely ever to be completely level as long as forestry and forest industries development globally are used as tools for economic and social development. This applies not just to developing countries but to many underutilized timber areas in developed countries, including Western Europe, the United States and Canada.

With these qualifications in mind, it is still important in a long range strategic study of this type to assess the likely shifts in product-mix of various areas. Moreover, it is important as a basis for predicting where a region or country's comparative advantages lie in trade, domestically and in export markets."

In Volume I, we discuss:

(1) fundamental cost competitiveness (Volume VI analysis)

and (2) overall competitiveness, taking the other factors into account.

The "other factors" discussed in Volume I include the following:

- depreciation and financial changes, as well as regional differences in tax treatment;
- other investment factors, such as currency effects;
- technology, quality and service;
- integration synergies and economies of scale, and in particular, differences in productivity.

In developing the models for the fundamental cost factors presented in this volume, the principal source of data on market pulp and newsprint 1987 costs was the studies conducted by Price Waterhouse on behalf of the Forest Sector Advisory Council (FSAC). Data in other regions and for other products were developed by Price Waterhouse and Woodbridge Reed for this study.

Assumptions on future costs came from a variety of sources, including RISI, but particularly represent the joint views of Price Waterhouse and Woodbridge Reed.

This volume of the report presents our analysis of the current and future costs in three ways: (1) by each of the major cost elements, (2) by product and (3) by region, focussing in the regional analysis on the opportunities that our cost competitiveness will present over the period covered by the study.

## ANALYSIS OF UNIT COSTS

This section takes the four major cost elements: labour, energy, furnish materials and delivery cost, and compares each on a country-by-country or region-by-region basis. As already stated, the cost studies published by the Forest Sector Advisory Council (FSAC) were the principal source of accurate current data. In the case of market pulp, preliminary 1987 FSAC data were available and were used. In the case of newsprint, 1986 data were available and were updated to 1987 on the basis of the trends observed in the market pulp study. These costs have been used for Canada, the United States and Scandinavia. Data for other regions were estimated from a variety of sources and are thought to be reasonably representative.

The comparison uses 1987 as a base and projects how relationships might change between 1987, 1995 and 2010. The trend data are our judgement, based upon general knowledge of the regions and countries involved.

Foreign exchange rates are as at July 22, 1988. These rates fluctuate constantly, sometimes violently. The reader should take rate changes from July 1988 into account when reviewing this volume of the report.

### Labour Costs

Our analysis is limited to overall labour costs per tonne of product output. We have made no in-depth attempt to reconcile differences in productivity as this is a complex issue involving consideration of other factors such as capital intensity, comparable technology and age of facilities.

A summary of 1987 costs per hour in United States dollars is set out in Table 1 for all the regions being studied.

**Table 1**
**Comparative Labour Costs**

| Region | 1987 Cost Per Hour Worked (1) (US$) | Competitiveness Factor (2) 1987 | 1995 | 2010 |
|---|---|---|---|---|
| Brazil | 6 | 1 | 1 | 2 |
| Chile | 6 | 1 | 1 | 2 |
| Iberian Peninsula | 15 | 4 | 4 | 4 |
| New Zealand | 17 | 4 | 5 | 5 |
| Atlantic Provinces | 17 | 4 | 4 | 4 |
| Quebec | 19 | 5 | 5 | 5 |
| Ontario | 20 | 5 | 5 | 5 |
| Finland | 20 | 5 | 6 | 7 |
| Prairies | 21 | 6 | 5 | 5 |
| Sweden | 21 | 6 | 6 | 7 |
| US West Coast | 21 | 6 | 6 | 6 |
| US Inland Empire | 21 | 6 | 6 | 6 |
| BC Coast | 22 | 6 | 6 | 5 |
| US South | 22 | 6 | 6 | 6 |
| BC Interior | 23 | 6 | 6 | 5 |
| US North | 23 | 6 | 6 | 6 |
| Japan | 30 | 8 | 10 | 10 |

(1) 1987 costs are at exchange rates as at July 22, 1988
(2) The most competitive is the factor 1. The least competitive is 10.

As already noted, a large change in the exchange rate would significantly affect competitiveness; for example, the Canadian dollar strengthened from US$0.754 to US$0.833 over a twelve month period between 1987 and 1988, a change in excess of 10%. This change alone completely removed the labour advantage enjoyed by Canada in 1987 and left the United States regions as competitive, or potentially even more competitive, than Canadian regions. There are significantly conflicting views as to the long-term proper equilibrium exchange differentials between Canada and the United States and no attempt is made in this study to reflect such differentials in the examination of cost competitiveness.

Our commentary on Table 1 is as follows:

- At the present time, labour costs per hour worked are lowest in Brazil and Chile, followed by the Iberian Peninsula, New Zealand, the Atlantic provinces, Quebec, Sweden, Finland and the other North American regions. Japan has the highest labour cost per hour worked of all pulp and paper producing regions.

- Labour costs in Brazil and Chile are estimated at about US$6 per hour worked, or less than half the labour costs in the next lowest cost competing regions. Labour costs are expected to increase more rapidly than in Europe and North America, but the impact of this will depend on how their large foreign currency denominated debt is handled. The likelihood is that devaluations will offset much of the labour cost increases leaving relatively modest increases in US dollar terms.

- The cost in New Zealand is expected to increase in real terms as the labour unions in that country are relatively strong and they are expected to succeed in gaining higher real wages for their members.

- The Atlantic provinces are the lowest Canadian cost region showing an average cost per hour worked of US$17. Quebec is closely followed by Ontario at US$20, the Prairies at $21, and the British Columbia regions at $22 on the Coast and $23 in the Interior.

- Over the next few years, Quebec is expected to remain slightly better than the Canadian average although the economic situation of that province has been improving consistently over the last five years. Ontario is currently experiencing five years of continuous economic growth, but the northern portion of the province continues to experience high unemployment, thereby restraining the increases in wages and salaries. Over the next two decades, Ontario costs are expected to increase slightly relative to the rest of Canada.

- In British Columbia, labour costs per hour worked are expected to increase slightly over the next few years as a result of the July 1988 settlement. The provincial unemployment rate remains at 12% or about 3% higher than the national average of 9%. The unions in British Columbia are very strong but the membership has been hard hit by the recession and we do not expect them to make significant further real gains compared with other areas over the next 20 years. Furthermore, we expect the older, less labour-efficient mills to be modernized or replaced with more labour-efficient mills so that in real terms labour costs in British Columbia will tend to return to the Canadian average.

- Labour costs in Finland and Sweden are estimated at US$20 and US$21 per hour, respectively. They are, therefore, comparable to those in Eastern Canada and are slightly lower than those in British Columbia. Labour costs per hour worked for these two regions are expected to rise slightly faster than in Canada over the next 20 years making these regions less competitive. No major gains in economic growth or major social changes are expected in these countries.

- The United States regions have labour costs which are now comparable with Canada as a result of the depreciation of the US dollar in Canadian dollar terms which took place in early 1988. Hourly labour costs in the US West and Inland Empire are estimated at US$21, at $22 in the South and at $23 in the North. Labour costs in the United States are expected to remain comparable over the next 20 years relative to Canada, although there could be some temporary mismatches owing to exchange fluctuations.

- Labour costs are highest in Japan, at an estimated US$30 per hour worked. Costs are expected to increase further as Japanese labour succeeds in capturing a greater portion of the economic gains experienced in that country over the last decade.

- In conclusion, the relative position of each region in terms of labour cost per hour worked is expected to remain about the same as it is now. More as a result of technology catch up, Western Canada should improve its competitive position slightly compared with other areas in the longer term so that regional disparities among Canadian regions will diminish over the next 20 years. The exception to this is the Atlantic provinces which will remain much below the Canadian average. Brazil and Chile may have relative cost increases but their current absolute advantage is so large that it will not be eroded. Sweden, Finland and Japan will continue to see their competitiveness decrease as labour cost increases outpace the cost of living.

## Energy

A summary of 1987 purchased electric power costs per megawatt hour ("MWh") is set out in Table 2 below.

**Table 2**
**Comparative Energy Costs**

| Region | 1987 Cost Per MWh (1) (US$) | Competitiveness Factor (2) 1987 | 1995 | 2010 |
|---|---|---|---|---|
| Quebec | 22 | 1 | 2 | 2 |
| Prairies (average) | 22 | 1 | 2 | 2 |
| BC Coast | 25 | 2 | 2 | 2 |
| BC Interior | 25 | 2 | 2 | 2 |
| Ontario | 28 | 3 | 3 | 4 |
| New Zealand | 28 | 3 | 3 | 3 |
| Atlantic Provinces | 32 | 4 | 5 | 6 |
| Inland Empire | 34 | 5 | 6 | 6 |
| US West | 35 | 5 | 5 | 6 |
| Brazil | 38 | 6 | 5 | 4 |
| Chile | 40 | 6 | 5 | 4 |
| Sweden | 40 | 6 | 7 | 8 |
| Finland | 43 | 6 | 7 | 8 |
| US North | 46 | 6 | 7 | 8 |
| US South | 46 | 6 | 7 | 8 |
| Iberian Peninsula | 60 | 8 | 9 | 9 |
| Japan | 138 | 10 | 10 | 10 |

(1) 1987 cost per MWh at exchange rates in effect July 22, 1988
(2) The most competitive is the factor 1. The least competitive is 10.

For 1987, the table clearly demonstrates the advantage in power costs that all Canadian regions have, except the Atlantic provinces, over most other pulp and paper manufacturing countries. Despite overall inflation in Canadian energy prices we expect Canada's power cost advantage to be maintained over the study period. Our detailed commentary on Table 2 is as follows:

- The cost of purchased electric power is the lowest in Canada, other than the Atlantic provinces, followed by New Zealand, the US Inland Empire and US West, the Atlantic provinces, the South American and Scandinavian countries, other regions of the United States and the Iberian Peninsula. Japan is the least competitive with costs about five times higher than the Canadian average.

- Within the Canadian regions, the cost per MWh of electric power is lowest in Quebec and the Prairies at an average rate of US$22 per MWh. Both regions are major producers of electric power and have traditionally negotiated long-term contracts at reduced rates with major users, with the aim of stimulating regional development. We do not expect this to change in the future, particularly in Quebec where major electric power projects have been announced for the James Bay area (see Volume I).

- Electric power charges are also low in British Columbia, at an average rate of US$25. Rates are expected to remain very low by world standards as the Province still has substantial unused hydro electric power potential (Volume I).

- Rates in Ontario and the Atlantic provinces are fairly high by Canadian standards, at US$28 and US$32 per MWh, respectively. Power costs in Ontario are expected to remain constant through 1995 and then increase slowly. Ontario expects to expand its nuclear power generation rather than use higher cost fossil fuels. Power costs in the Atlantic provinces will likely increase more rapidly than the Canadian average, at least through 1995, pending introduction of lower cost power generation. There are no major hydro projects expected to come on stream in those regions (see Volume I).

- Power costs in the US West average US$35 per MWh on the Coast and US$34 in the Interior. These are expected to increase in the future as there are few opportunities for large scale expansions of electric power capacity using low cost generation sources. Power costs in the US South and the US North are estimated at US$46. These are also expected to increase significantly in the years ahead. Co-generation potential in the US nevertheless is very significant and, on a local site-specific or even regional basis (e.g. using wheeled power), individual facilities could achieve much lower than average unit costs for power.

- Power costs are at the US$28 level in New Zealand and are expected to remain at that level in the future as the country has the potential to increase capacity of hydro electric power.

- Power costs in Brazil and Chile are around the US$40 level. There are some factors pushing costs up, and some bringing them down. On balance, power costs in these areas are likely to drop by the year 2010 as the infrastructure becomes more extensive and expensive imported oil is replaced by hydro and other domestic energy sources. We expect power costs in these regions to be only slightly higher than the Canadian average by the year 2010.

- Sweden and Finland have power costs almost double those of Canada, at average rates of US$40 and US$43, respectively. These rates are expected to increase significantly over the next two decades. These countries rely heavily on nuclear power and, with the accident at Chernobyl, additional nuclear power plants are not likely for some time. There is limited capacity for further hydro electric power development, but some opportunities for co-generation.

- Power costs in the Iberian Peninsula are estimated at US$60 per MWh. As with Finland and Sweden, these costs are expected to increase as nuclear power becomes less acceptable in Western Europe as there is no significant capacity for low-cost power generation. Additional generation will have to be oil or nuclear-based, assuming no change in existing technologies.

- Japan has the highest power costs at an average rate of US$138 or about double the rate in the second least competitive region and about five times the Canadian average. Rates in Japan will continue to be very high by world standards as opportunities to increase low cost capacity are extremely limited.

- In conclusion, Canadian regions will remain competitive in energy costs by world standards. The relative positions of Brazil and Chile will improve and those of all other regions will worsen. High-cost power countries, i.e. Sweden and Finland in particular, will focus research and capital expenditures on energy conservation, use of biomass and co-generation to minimize their competitive disadvantage.

## Furnish Materials

The major components of furnish materials in the production of pulp and paper include fibre as well as cooking, bleaching, filler and coating chemicals. Fibre may also be subdivided into softwood and hardwood chips, roundwood and pulp. Recycled fibres also are important in many grades. Our review of the competitiveness of each region in terms of fibre costs as well as coating and filler materials is summarized below:

## Fibre Costs

Table 3 presents a comparison of the cost of softwood fibre for the 17 countries and regions included in the study. Table 4 presents similar data for hardwood fibre. Costs are on a chip equivalent basis. Any cost differential between chips and roundwood is either (a) not generally significant or (b) will tend to shrink over the study period in most areas, in our view.

**Table 3**
**Comparative Softwood Fibre Costs**

| Region | 1987 Average Cost per BDMT(1) (US$) | Competitiveness Factor (2) 1987 | 1995 | 2010 |
|---|---|---|---|---|
| Chile | 34 | 1 | 1 | 2 |
| Brazil | 38 | 1 | 2 | 2 |
| US South | 48 | 3 | 3 | 4 |
| Prairies | 49 | 3 | 4 | 5 |
| Inland Empire | 51 | 4 | 5 | 5 |
| Iberian Peninsula | 53 | 4 | 5 | 6 |
| BC Interior | 57 | 5 | 5 | 5 |
| US West | 60 | 5 | 5 | 6 |
| New Zealand | 65 | 6 | 5 | 4 |
| US North | 65 | 6 | 6 | 6 |
| BC Coast | 65 | 6 | 6 | 7 |
| Ontario | 72 | 6 | 6 | 7 |
| Quebec | 76 | 7 | 7 | 7 |
| Atlantic Provinces | 80 | 7 | 6 | 7 |
| Sweden | 122 | 8 | 9 | 9 |
| Finland | 132 | 9 | 9 | 9 |
| Japan | 166 | 10 | 10 | 10 |

(1) 1987 average cost at exchange rate in effect at July 22, 1988
(2) The most competitive is the factor 1. The least competitive is 10.

**Table 4**
**Comparative Hardwood Fibre Costs**

| Region | 1987 Average Cost per BDMT (1) (US$) | Competitiveness Factor (2) 1987 | 1995 | 2010 |
|---|---|---|---|---|
| Chile | 27 | 1 | 1 | 2 |
| Brazil | 30 | 1 | 1 | 2 |
| US South | 46 | 3 | 3 | 5 |
| Iberian Peninsula | 47 | 3 | 4 | 5 |
| US West | 60 | 4 | 5 | 5 |
| US North | 60 | 4 | 5 | 6 |
| Inland Empire | 60 | 4 | 5 | 6 |
| Prairies | 67 | 5 | 5 | 6 |
| Ontario | 69 | 5 | 5 | 6 |
| BC Interior | -- | -- | 5 | 6 |
| Quebec | 72 | 5 | 5 | 6 |
| BC Coast | -- | -- | 6 | 6 |
| Atlantic Provinces | 80 | 6 | 6 | 7 |
| New Zealand | 79 | 6 | 6 | 5 |
| Sweden | 116 | 8 | 9 | 9 |
| Finland | 127 | 9 | 9 | 9 |
| Japan | 166 | 10 | 10 | 10 |

-- = not used by domestic industry in significant quantity during survey period.

(1) 1987 average cost at exchange rate in effect at July 22, 1988
(2) The most competitive is the factor 1. The least competitive is 10.

Our commentary on fibre cost comparisons is as follows:

- Brazil and Chile have by far the lowest fibre costs at costs of between $27 and $30 per BDMT for hardwood and for softwood US$34 and US$38 per BDMT.

- The US South follows South America with US$48 per BDMT, the Canadian Prairies with US$49, and the US Inland Empire at US$51 per BDMT for softwood. New Zealand, the Iberian peninsula and other Canadian and US regions have softwood costs ranging between US$53 in the Iberian Peninsula, and US$80 in the Atlantic provinces.

- There is a wide range of prices for fibre in the US West. The FSAC study mills report $48 per BDMT, whereas chip export prices are in the $80 range. The $60 cost selected for use in this competitive analysis is therefore a compromise.

- Sweden, Finland and Japan are the least competitive with softwood fibre costs of US$122, US$132, and US$166, respectively.

- Fibre costs in both Brazil and Chile are expected to remain extremely competitive in the next two decades. There are new plantations coming on stream such that the current advantage will remain for the years ahead.

- Fibre costs are also very competitive in the Iberian Peninsula. There is very little softwood in that region but hardwood costs average around US$47 per BDMT. Fibre costs in that region are expected to increase in the next two decades as increased levels of investment are expected to flow into the country from companies in Scandinavia and Western Europe, particularly West Germany. The growing cycle for trees is attractive compared to Sweden and Finland and there is an increasing demand for hardwood pulp. Portugal and Spain are now part of the common market.

- Fibre costs are also relatively low in the British Columbia Interior. This is changing, at least in the short-term, under pressure from the British Columbia government. However, the longer term price will continue to be market driven. Costs per BDMT for softwood chips in the BC Interior were US$57 in 1987. In the Interior of British Columbia, for economic reasons, there is virtually no roundwood chipped. Consequently, the supply and price of chips has fluctuated with the buoyancy of lumber and pulp markets.

- Fibre costs in the BC Interior are expected to increase in the future primarily because the current chip surplus will eventually disappear with the advent of new pulping capacity. Furthermore, the supply of higher quality wood will also drop to some extent. Increasing amounts of pulpwood will be harvested as chip prices rise and change the economics of logging low quality wood. Also, logging and silviculture costs will increase until the second growth forest is ready for harvest. The same holds for the BC Coast, and fibre costs are expected to increase in that region as well. The new comparative value pricing system for stumpage calculation has already increased costs in British Columbia, particularly in the Interior. However, with chips considered a by-product in the Interior (mainly of lumber manufacturing) and a joint product on the Coast, the price is unlikely to rise to the point where British Columbia becomes uncompetitive. Hardwoods are not currently harvested as a mill furnish in British Columbia to any significant extent. It is anticipated this will change as softwood chips become more scarce and expensive and as markets accept mix-wood BCTMP.

- Fibre costs on the Canadian prairies are the lowest in Canada. The cost per BDMT ranges around US$49 for softwood and about US$67 for hardwood. Fibre costs on the prairies will increase as fast as elsewhere in Canada, but should maintain their cost advantage, primarily because the stumpage rates are relatively low to encourage development. These policies are not expected to change in the near future.

- Ontario and Quebec have softwood fibre costs of US$72 and US$76, respectively. These are only about 10% higher than the BC Coast but substantially higher than in the BC Interior and in the prairies. Fibre costs in the Atlantic provinces are even higher at about US$80 per BDMT for softwood. Costs are about equal or slightly lower for hardwood. Fibre costs in Eastern Canada are expected to increase. Demand is expected to rise but supplies, especially in Quebec, are somewhat limited as was discussed in a previous section of the report.

- New Zealand is very competitive in terms of fibre costs for softwood at an average cost of about US$65 per BDMT. This cost is expected to remain competitive relative to other regions as large amounts of softwood timber will be ready to harvest around the mid 1990s. Hardwood costs are higher at about US$79. This cost is expected to remain high in the immediate future as there are currently no major hardwood plantations, although they can be expected by 2010 at which time costs can be expected to decline somewhat.

- The US Inland Empire is also very competitive in terms of fibre costs, averaging about US$51 per BDMT for softwood and US$60 for hardwood. The US South is more competitive, averaging US$46 and US$48 per BDMT for hardwood and softwood respectively. Fibre costs are about 25-30% higher in the US West and US North. Fibre costs in the United States are expected to increase over the next two decades as there are limited supplies of first growth timber left and there are also limited supplies of second growth timber. However, with chips considered a by-product (or at best a joint product), softwood chip prices are unlikely to rise to the point where the US becomes uncompetitive.

- Sweden and Finland have very high fibre costs at about US$122 and US$132 per BDMT, respectively. Fibre costs are slightly lower for hardwood. Fibre costs in Sweden and Finland are expected to remain stable in the next two decades. Both countries already rely almost entirely on second and third growth timber. Accordingly, the costs in these regions already reflect the full costs of reforestation and infrastructure development. Mills in these countries will increasingly try to import logs from Russia and tropical or semi-tropical countries.

- Fibre costs are highest in Japan, where they reach an estimated US$166 per BDMT for both softwood and hardwood. No improvement in fibre costs is foreseeable in Japan.

- In conclusion, Brazil, Chile and other South American countries will remain the low cost producers. United States regions will be the next lowest although overall their costs will be 50-100% higher than Brazil and Chile. New Zealand and the Iberian Peninsula, with their new plantations coming into production in the 1990s, will follow. Canadian softwood fibre will lose ground to all regions but Scandinavia and Japan. Consequently, Canada will see one of its two key competitive advantages lost to South America in particular. The significance of this is hard to measure, since political and other factors will impact the speed with which South America can capitalize on its low cost fibre. In hardwoods however, we should be able to maintain our present competitiveness.

## Filler and Coating Materials

Filler and coating materials are used in varying degrees for virtually all types of papers. Low cost clays and even some moderate quality clays are available in all producing countries but only the United Kingdom and the US South have high quality white clay deposits which are being exploited today. While potential for new sources exists, at the present time all paper producing countries import the white clays from these two regions, thereby incurring the additional transportation costs. Accordingly, today, the competitiveness of any region producing coated papers, from the perspective of coating and filler costs, depends significantly on its delivery distances, logistics and related costs of clay from either the US South or the U.K.

There have been some discoveries of white clay deposits in Mainland China, Australia and other areas. However, there do not appear to be any firm plans to exploit these significantly at the present time, so we expect the current supply situation to remain unchanged at least until 1995. By the year 2010, Pacific Rim countries may be benefitting from Pacific Rim supply sources of high quality white clays.

Based on this assumption, the competitiveness of each region in terms of filler and coating materials is as follows:

- The US South is most competitive because of its local deposits of white clays.
- The US North, Finland and Sweden are close behind because of their proximity to the US South and the UK deposits.
- Ontario, Quebec and the Atlantic provinces are relatively competitive as well, because of their proximity to the US South. Next come the US West and Inland Empire regions, followed by the British Columbia Coast, and to a lesser extent the BC Interior, and the Prairies, all of which would have to import white clays from the US South.
- The cost of importing white clays is slightly higher in the Iberian peninsula, where white clays are imported from the UK.
- Lastly, New Zealand, Brazil, Chile, and Japan currently all pay relatively higher prices, being the furthest away from both the US South and the UK.

The above analysis takes no account of an expected switch to alkaline paper making. Under this process all but the highest quality papers could be manufactured using calcium carbonates ($CaCO_3$) or $CaCO_3$ mixed with clay. For example, Weyerhaueser's new Prince Albert woodfree paper machine will use precipitated $CaCO_3$ in its alkaline paper making process. $CaCO_3$ is almost universally available and can be expected over time to replace white clays in medium to low priced grades.

## Delivery Costs

In our analysis of delivery costs we have dealt only with typical averages. Clearly there is considerable variation intra-regionally, particularly as a result of deregulation and special factors such as backhaul potential.

Major markets for pulp and paper products are Western Europe, South East Asia (particularly Japan) and the United States. This section reviews the delivery cost of each region to Western Europe, Japan and the US Atlantic Seaboard. Our analysis is summarized in Table 5.

**Table 5**
**Comparative Delivery Costs**

| | 1987 Cost per ADMT (US$)(1) | | |
|---|---|---|---|
| **Region** | **Europe** | **Japan** | **US Atlantic** |
| Iberian Peninsula | 21 | 68 | 59 |
| Sweden | 35 | 70 | 60 |
| Finland | 41 | 71 | 61 |
| US West | 42 | 40 | 45 |
| Ontario | 44 | 61 | 44 |
| Quebec | 44 | 61 | 44 |
| Atlantic Provinces | 44 | 55 | 44 |
| BC Coast | 49 | 44 | 61 |
| Inland Empire | 50 | 50 | 45 |
| US North | 54 | 49 | 40 |
| US South | 54 | 49 | 40 |
| Brazil | 61 | 70 | 55 |
| Chile | 61 | 70 | 55 |
| BC Interior | 70 | 65 | 60 |
| Prairies | 70 | 65 | 60 |
| Japan | 77 | 22 | 77 |
| New Zealand | 79 | 45 | 79 |

(1) 1987 average cost at exchange rate in effect at July 22, 1988

The above table reflects the 1987 cost position at the exchange rates prevailing on July 22, 1988. With regard to the years 1995 and 2010, we expect little change in the relative position of each region with respect to delivery costs because little change in real shipping rates is expected. The principal beneficiaries of increases in world shipping rates would be the countries with existing competitive advantages in specific markets, e.g. Scandinavia to Europe; West Coast North America to Japan; all regions to internal customers. On the basis of the 1987 costs and exchange rates our comments are as follows:

- Shipping costs to Western Europe range between US$21 per tonne from the Iberian Peninsula and almost US$80 per tonne from Japan and New Zealand. Costs are US$35 per tonne from Sweden, US$41 to US$44 for Finland, US West, Ontario, Quebec and the Atlantic provinces, and slightly higher for the BC Coast. Delivery costs to Western Europe are about US$50 from other US regions and about US$70 from the BC Interior and the Prairies.

- Japanese mills incur delivery costs of about US$22 to supply the domestic market. Shipping costs to Japan from other countries are between US$40 per tonne for the US West and about US$70 per tonne from Brazil, Chile, Finland, the Iberian Peninsula and Sweden. Within North America, the BC Coast and US West enjoy the lowest cost to Japan at US$44 and US$40 per tonne respectively, and the BC Interior and the Prairies have the highest cost at US$65 per tonne.

- Shipping costs to the US Atlantic seaboard are lowest from Eastern Canada and from the various regions of the United States, where they range around US$40 to US$45 per tonne. Costs are US$55 per tonne from Brazil and Chile. Shipping costs are the highest from the BC Coast, the BC Interior, the Prairies and the European countries, ranging around US$60 per tonne and from Japan and New Zealand at almost US$80 per tonne.

## PRODUCT ANALYSIS

This section takes the analysis of the individual cost elements of (a) furnish materials, (b) labour, (c) energy and (d) delivery set out in the previous chapter and combines them for specific products on a weighted cost basis. As weights we used estimates of the proportionate costs in effect in 1987. The key assumption in this approach is that the current proportions of each cost element will apply forward to 1995 and 2010.

The combination of the individual costs and the related weighing enables a reasonable projection of the relative change in product competitiveness among the regions during the study period. Furthermore, it is relatively easy to determine the impact on the competitive rankings of changes in the basic assumptions for individual cost elements.

The important other factor which is not taken into account in this product analysis is the will and ability of regions to keep their pulp and paper mills technologically current and to scale. New developing regions such as New Zealand, Iberia, South America and to some extent the Canadian Prairies will develop large scale technologically efficient mills thus capitalizing on their inherent natural advantages. Regions with older plants such as Ontario and British Columbia will actually lose ground compared with other regions if they do not take appropriate action.

There is a cost attached to capital expenditures related to such modernization and development and these costs in turn impact on competitiveness. For example, new plants in Brazil or Chile may also involve significant capital costs for infrastructure development. The related amortization and financial costs will likely offset their other natural advantages throughout much of the study period. In Volume I, we discuss the potentially uncertain outlook for Canada's future cost competitiveness in market pulp, as a result of the need to catch up on modernization and cope with new environmental regulations.

The products covered by this analysis are market BK pulp, newsprint, CTMP, uncoated and coated freesheet, unbleached linerboard, white top liner and SBS.

The analyses and ratings apply to each product group and refer to comparative rankings e.g. market pulp in Brazil vs BC Coast. **THE RANKINGS SHOULD NOT BE COMPARED 'PRODUCT TO PRODUCT' ON A COUNTRY OR REGIONAL BASIS,** e.g. it is inappropriate to compare the ranking for market pulp in Quebec with that for newsprint in the same jurisdiction.

## Market BKP

The consolidation of the results of the analysis of key cost elements for market BK pulp is summarized in Table 6 below:

**Table 6**
**Competitiveness of Bleached Kraft Market Pulp**
**Ranking of Regions by Consolidated Weighted Cost Differentials**

| Region | Softwood | | | Hardwood | | |
|---|---|---|---|---|---|---|
| | 1987 | 1995 | 2010 | 1987 | 1995 | 2010 |
| Brazil | 1 | 2 | 2 | 1 | 1 | 2 |
| Chile | 1 | 1 | 2 | 1 | 1 | 2 |
| US South | 4 | 4 | 4 | 4 | 4 | 5 |
| Inland Empire | 4 | 5 | 5 | 4 | 5 | 6 |
| Prairies | 4 | 4 | 5 | 5 | 5 | 6 |
| Iberian Peninsula | 4 | 5 | 6 | 3 | 4 | 5 |
| US West | 5 | 5 | 5 | 4 | 5 | 5 |
| BC Interior | 5 | 5 | 5 | 5 | 5 | 6 |
| New Zealand | 5 | 5 | 4 | 6 | 7 | 8 |
| US North | 6 | 6 | 6 | 5 | 5 | 6 |
| BC Coast | 6 | 6 | 6 | 6 | 6 | 6 |
| Atlantic Provinces | 6 | 6 | 6 | 6 | 6 | 7 |
| Ontario | 6 | 6 | 6 | 5 | 5 | 6 |
| Quebec | 6 | 6 | 6 | 5 | 5 | 6 |
| Sweden | 7 | 8 | 9 | 7 | 8 | 8 |
| Finland | 8 | 8 | 9 | 8 | 8 | 9 |
| Japan | 10 | 10 | 10 | 10 | 10 | 10 |

Table 6 summarizes the competitive rankings for the years 1987, 1995 and 2010 for both softwood and hardwood bleached kraft market pulp. The weights used in the consolidation are the average costs of fibre, energy and labour experienced in 1987 in North America and Scandinavia as determined by the FSAC studies applied using 1988 exchange rates.

In reviewing the rankings set out in Table 6, it is important to remember that they are based on mid-1988 exchange rates. However, over the long-term the exchange rates could well change considerably for reasons outside the control of the forest industry, thus considerably altering the above rankings.

The 1987 rankings obtained above were compared and confirmed using the preliminary results of the 1987 FSAC study of market pulp costs.

The conclusions to be drawn from the above table are:

- Brazil and Chile are the most cost competitive in market pulp in 1987 and will remain so. Their inherent advantage in both fibre costs and labour rates is overwhelming and will, for the foreseeable future, offset any higher transportation costs resulting from their geographic distance from major markets.

- The principal market pulp regions of the United States will continue to be competitive with all regions other than Brazil and Chile. The only other country expected to be competitive with these regions is New Zealand when its new plantations come into harvest in the mid 1990s. However, transportation costs and other considerations, such as the fairly low rating given to Radiata Pine pulp by major importers, will probably ensure that New Zealand focusses its marketing on Pacific Asia and Australia.

  In discussing Australia (not included for the purposes of this analysis), we acknowledge its capability in eucalyptus market pulp exports. At the present time, however, it is unclear how Australian potential will develop with regard to market pulp sales. Currently, significant new capacity is planned, some involving Canadian companies, as discussed in Volume III, and some of this will displace softwoods, particularly from Canadian sources.

- The Prairies are expected to show increased costs by the year 2010, principally resulting from higher fibre costs due to both increased harvesting and silviculture costs. Although the summary data in the table do not fully reflect it, the BC Interior will also face increased costs by the year 2010 for the same reasons.

- The Iberian Peninsula will continue to be more competitive than Eastern Canada and become more of a threat in the European markets as their production increases to its full potential and displaces some Canadian sales. In the European market, of course, Spain and Portugal will also have a substantial advantage in transportation costs over North America.

- Ontario and Quebec will maintain their competitive edge over Sweden and Finland where costs are expected to increase relatively faster than in Eastern Canada. However, a repetition of the substantial devaluation, of the early 1980s, in Scandinavian currencies is possible if Sweden and Finland find their costs moving too far out of line, simply because of the relatively greater significance of the forest industry to their overall economic well-being.

## Newsprint

Some key differences between kraft market pulp and newsprint are that newsprint requires substantially more energy and labour per tonne in proportion to fibre than does kraft pulp. Also, it is based on higher yield fibres. As already discussed, Canada (other than Ontario and the Atlantic provinces) is the world's low cost electrical energy producer.

The results of the analysis of key cost elements for commodity grade newsprint are summarized in Table 7:

**Table 7**
**Competitiveness of Newsprint**
**Ranking of Regions by Consolidated Weighted Cost Differentials**

| Regions | 1987 | 1995 | 2010 |
|---|---|---|---|
| Chile | 1 | 1 | 1 |
| Brazil | 1 | 1 | 2 |
| Prairies | 2 | 3 | 4 |
| BC Interior | 3 | 3 | 4 |
| New Zealand | 3 | 4 | 4 |
| Quebec | 5 | 5 | 5 |
| Ontario | 5 | 5 | 5 |
| BC Coast | 5 | 5 | 5 |
| US South | 5 | 5 | 5 |
| US West | 5 | 5 | 6 |
| Atlantic Provinces | 5 | 6 | 6 |
| Inland Empire | 5 | 6 | 6 |
| Iberian Peninsula | 5 | 6 | 6 |
| US North | 6 | 6 | 7 |
| Sweden | 6 | 8 | 8 |
| Finland | 7 | 8 | 8 |
| Japan | 10 | 10 | 10 |

Our commentary on the newsprint analysis is as follows:

- Brazil and Chile are the low net cost producers of newsprint because of their low fibre and labour and relatively competitive energy costs. However, see comments in Volume III.

- New Zealand has the potential to be very competitive with North American and European newsprint because of its low energy and fibre costs and moderate fibre quality (Radiata). However, volumes are not likely to be substantial and Antipodean or Pacific Rim markets will likely absorb all their export production (see Volume III).

- The North American newsprint manufacturing regions are expected to remain in somewhat similar positions to 1987 except that Quebec, Ontario, and the Atlantic provinces will lose ground slightly by 2010 as labour and fibre costs increase. The Atlantic provinces will also experience higher energy costs. Nevertheless, they should remain competitive in their principal United States and European markets. Ontario may lose additional ground at least in the short term as it has not modernized its newsprint mills.

- The Iberian Peninsula, Sweden and Finland all are less competitive than other regions and are expected to remain so throughout the study period. They will continue to enjoy their delivery cost advantage to Europe, which will keep them reasonably competitive in that market.

- Technologically, the use of recycled fibre in newsprint is significant in some areas: however, we have assumed that the bulk of newsprint will continue to be produced using virgin fibres and that long-fibred furnishes will continue to prevail.

- It is recognized that an increasingly high proportion of virgin fibre newsprint will be produced from 100% TMP/CTMP furnish.

## CTMP

In CTMP, about 44% of the combined cost of labour, power, and fibre is the energy component compared with 5% for market BK pulp. Fibre only amounts to 40% of these costs compared with 75% in the case of kraft pulp. Therefore, although CTMP production entails higher energy costs in comparison to kraft, they are offset by higher pulp yields on wood. Countries with low cost sources of energy and high fibre costs could therefore produce CTMP and overcome at least some of their high fibre cost disadvantages. The results of our comparative analysis of CTMP costs is summarized for the years 1987, 1995, and 2010 in Table 8.

**Table 8**
**Competitiveness of CTMP**
**Ranking of Regions by Consolidated Weighted Cost Differentials**

| Region | Softwood | | | Hardwood | | |
|---|---|---|---|---|---|---|
| | 1987 | 1995 | 2010 | 1987 | 1995 | 2010 |
| Brazil | 1 | 1 | 1 | 1 | 1 | 1 |
| Chile | 1 | 1 | 1 | 1 | 1 | 1 |
| Prairies | 1 | 2 | 2 | 2 | 2 | 2 |
| BC Interior | 2 | 2 | 2 | 2 | 2 | 2 |
| Quebec | 2 | 2 | 3 | 2 | 2 | 3 |
| BC Coast | 2 | 3 | 3 | 3 | 3 | 4 |
| New Zealand | 3 | 4 | 4 | 4 | 4 | 5 |
| Ontario | 4 | 5 | 5 | 4 | 4 | 5 |
| US West | 5 | 5 | 6 | 5 | 5 | 6 |
| US South | 5 | 5 | 6 | 5 | 5 | 6 |
| Atlantic Provinces | 5 | 6 | 6 | 5 | 6 | 6 |
| Inland Empire | 5 | 6 | 6 | 5 | 6 | 6 |
| US North | 6 | 6 | 7 | 5 | 6 | 7 |
| Iberian Peninsula | 6 | 7 | 7 | 5 | 6 | 7 |
| Sweden | 6 | 8 | 8 | 6 | 8 | 8 |
| Finland | 7 | 8 | 8 | 7 | 8 | 8 |
| Japan | 10 | 10 | 10 | 10 | 10 | 10 |

- As in other products, Brazil and Chile are the most cost competitive. In fact, they should become more competitive if they develop lower cost energy. Nevertheless, the 'opportunity cost' to low cost wood areas is the ability to produce very competitive kraft pulps and papers.

- The Prairies (notably Alberta), plus Quebec, British Columbia and New Zealand are currently the next most cost competitive regions. Moreover, on a volume of output basis and closeness to markets, they rank very high. However, the strongly competitive position of Quebec is expected to erode over the next 20 years because all costs will increase somewhat.

- New Zealand is also very cost competitive. However, higher labour costs in New Zealand will erode its current competitiveness somewhat over the next 20 years.

- Ontario and the Atlantic provinces are quite competitive with all the United States regions in CTMP. Higher energy and fibre costs will erode their competitive position slightly over time.

- European countries are at a disadvantage in the production of CTMP because of higher energy costs. Even Spain and Portugal with their comparatively low cost fibre are no more competitive on balance than North American producers. However, their delivery cost advantage to Europe still could make CTMP capacity attractive in Spain and Portugal.

- Sweden and Finland at current exchange rates continue to be the least competitive after Japan in terms of CTMP costs.

## Lightweight Coated Paper and Supercalendered Paper

Our analysis of the cost competitiveness of lightweight coated (LWC) and supercalendered (SC) clay-filled paper assumes mills which manufacture their own mechanical pulp furnish but which purchase market BKP. The reader is referred to Volume III for further discussion of these grades and their furnish components. Moreover, there are a wide range of other investment related considerations to be taken into account in these higher value grades.

As we move into cost comparisons for higher value added products such as LWC and SC there is a lessening of the dependency on low cost fibre. Consequently, many regions lose their natural resource cost advantage. The extremes are still there, with Brazil and Chile with very low fibre costs as the lowest cost regions and Sweden, Finland and Japan at the high cost end. The rest of the regions are all clustered together. This is clearly illustrated in Tables 9 and 10 below which rank the competitiveness of lightweight coated and supercalendered papers.

**Table 9**
**Competitiveness of Lightweight Coated Paper**
**Ranking of Regions by Consolidated Weighted Cost Differentials**

| | 1987 | 1995 | 2010 |
|---|---|---|---|
| Brazil | 1 | 1 | 1 |
| Chile | 1 | 1 | 1 |
| Prairies | 2 | 2 | 3 |
| US South | 3 | 4 | 5 |
| Quebec | 3 | 4 | 4 |
| New Zealand | 4 | 4 | 4 |
| Ontario | 4 | 5 | 5 |
| Atlantic Provinces | 4 | 5 | 5 |
| BC Coast | 4 | 5 | 5 |
| BC Interior | 5 | 5 | 4 |
| US West | 5 | 5 | 5 |
| Inland Empire | 5 | 5 | 5 |
| US North | 5 | 6 | 6 |
| Iberian Peninsula | 5 | 6 | 6 |
| Sweden | 6 | 7 | 7 |
| Finland | 6 | 7 | 7 |
| Japan | 9 | 9 | 10 |

**Table 10**
**Competitiveness of Supercalendered Clay-Filled Paper**
**Ranking of Regions by Consolidated Weighted Cost Differentials**

| | 1987 | 1995 | 2010 |
|---|---|---|---|
| Chile | 2 | 2 | 2 |
| Brazil | 2 | 3 | 2 |
| Prairies | 2 | 3 | 3 |
| Quebec | 3 | 3 | 4 |
| US South | 3 | 4 | 5 |
| New Zealand | 4 | 4 | 4 |
| BC Interior | 4 | 4 | 4 |
| Ontario | 4 | 4 | 5 |
| Atlantic Provinces | 4 | 5 | 5 |
| BC Coast | 4 | 4 | 5 |
| US West | 5 | 5 | 5 |
| US Inland Empire | 5 | 5 | 5 |
| US North | 6 | 6 | 6 |
| Iberian Peninsula | 5 | 6 | 6 |
| Sweden | 6 | 7 | 8 |
| Finland | 6 | 7 | 8 |
| Japan | 9 | 9 | 10 |

With regard to lightweight coated papers:

- The lowest cost producing areas in North America, in terms of major cost components, are the US South, the Mid West (not shown in the analysis) the Prairies (not a producing region currently) and Quebec. All other North American regions are about equally competitive. However, the US South is expected to lose its competitiveness by 2010 with higher costs generally and the likely substitution elsewhere of lower cost filler materials.

- Transportation costs therefore play a significant role in determining competitiveness in specific markets. For example, although not one of the regions specifically identified in this analysis, the US Mid West is very competitive in LWC because of its proximity to the highly populated publications papers areas of Illinois and Ohio Valley. Similarly the US West and BC Coast are highly competitive in California. Sweden and Finland are more competitive in Germany and the E.C. which are their principal markets.

- The other important factor which differentiates the similarly cost competitive regions is technology and product quality. Here, too, the Swedes and the Finns are leaders, and this advantage permits them to compete at the higher value end of the product line.

- As low cost calcium carbonates are substituted for more expensive white clays, the US South may lose some of its current cost advantage but proximity to markets will always keep it competitive.

With regard to supercalendered papers the same comments generally apply, and in addition:

- New Zealand will become more competitive by 1995 and may displace some North American production from West Coast mills in Pacific Rim countries.
- There is considerable scope for upgrading older slower newsprint machines by the addition of supercalenders, minimizing capital investment and filling relatively small market niches.

## Uncoated and Coated Freesheet

Uncoated and coated freesheet use high proportions of bleached kraft pulps and they are reviewed together. Only commodity grades are reviewed because specialty papers reflect unique situations as discussed elsewhere in this study. Coated freesheets use more filler and coating materials and less fibre per basis weight, but the nuance only results in small differences in the relative competitive position of the regions in producing each product. Both products have relatively labour intensive processes compared with other products. Thus, regions with low labour costs tend to be more competitive. Also, as noted, both products use primarily chemical rather than mechanical pulp, and regions which are competitive in producing BKP tend to be most competitive in producing uncoated and coated freesheets. Our ranking of competitiveness by country is set out on Table 11.

**Table 11**
**Competitiveness of Uncoated and Coated Freesheet**
**Ranking of Regions by Consolidated Weighted Cost Differences**

| | Uncoated Freesheet | | | | Coated Freesheet | | |
|---|---|---|---|---|---|---|---|
| | 1987 | 1995 | 2010 | | 1987 | 1995 | 2010 |
| Chile | 1 | 1 | 1 | Chile | 1 | 1 | 1 |
| Brazil | 1 | 1 | 1 | Brazil | 1 | 1 | 1 |
| US South | 2 | 2 | 2 | US South | 3 | 3 | 4 |
| Iberian Peninsula | 3 | 3 | 4 | Quebec | 3 | 3 | 4 |
| Quebec | 4 | 4 | 5 | Iberian Pen. | 4 | 4 | 5 |
| Ontario | 4 | 5 | 5 | Ontario | 4 | 4 | 5 |
| BC Coast | 4 | 5 | 5 | Atlantic Prov. | 4 | 5 | 5 |
| BC Interior | 4 | 5 | 5 | US North | 4 | 5 | 5 |
| Prairies | 4 | 4 | 5 | Prairies | 5 | 5 | 5 |
| Atlantic Provinces | 5 | 5 | 5 | BC Interior | 5 | 5 | 4 |
| US West | 5 | 5 | 5 | BC Coast | 5 | 5 | 5 |
| US North | 5 | 5 | 5 | US West | 5 | 5 | 5 |
| Inland Empire | 5 | 5 | 5 | Inland Empire | 5 | 5 | 5 |
| New Zealand | 5 | 6 | 6 | New Zealand | 5 | 6 | 5 |
| Sweden | 6 | 6 | 7 | Finland | 6 | 6 | 6 |
| Finland | 6 | 6 | 7 | Sweden | 6 | 6 | 7 |
| Japan | 9 | 9 | 10 | Japan | 8 | 9 | 8 |

- Table 11 shows that Brazil and Chile continue to be the most competitive regions for both coated and uncoated freesheet, based on their low wood costs. Brazil in particular has an advantage because of its access to low cost eucalyptus kraft pulps, and its current two-tier pricing structure in the domestic market.

- The US South follows because it is both very competitive in market BK pulp and is the North American source of white clays. Although changes to alkaline processes would eliminate some of the filler cost advantage, the US South's competitiveness in market pulp should allow it to maintain its position as the North American cost and quality leader.

- In commodity grade coated freesheet, both Quebec and Ontario are very competitive with the US South, in part because of their access to the US South's clay deposits at competitive cost. Again, technological changes causing substitution of calcium carbonates would eliminate the specific advantage of Quebec and Ontario. Their costs would then be quite similar to those in other North American regions.

- The other North American regions will be competitive in coated and uncoated freesheet depending upon economies of scale and proximity to customers. This situation should prevail through the study period but will be affected by technology, new products, product performance and new low cost sources of clay filler and coating materials.

## Unbleached Linerboard, White Top Liner, and SBS

Unbleached linerboard, white top liner and virgin fibre boxboard (SBS) use a similar furnish base and for current purposes are reviewed together. Although recycled fibres are an increasingly important component (e.g. testliner), for the purposes of this analysis, we have assumed that the latter two products use a very high proportion of softwood bleached kraft pulp and that the relative position of the regions for each of these products is essentially the same as for BKP.

As with BKP, at the present time Brazil and Chile are the most competitive regions for the production of kraft linerboard and SBS, followed by the US South, the Prairies and the Iberian Peninsula. Next is Ontario, the BC Interior, US West, Inland Empire and New Zealand. Quebec, the Atlantic provinces, the BC Coast and US North, while about equal, are the least competitive regions in North America.

Our analysis to the year 1995 and the year 2010 is summarized in Table 12.

**Table 12**
**Competitiveness of Unbleached Linerboard, White Top Liner and SBS**
**Ranking of Regions by Consolidated Weighted Cost Differentials**

| | 1987 | 1995 | 2010 |
|---|---|---|---|
| Chile | 1 | 1 | 2 |
| Brazil | 1 | 2 | 2 |
| US South | 3 | 3 | 4 |
| Prairies | 3 | 4 | 5 |
| Iberian Peninsula | 4 | 5 | 6 |
| US West | 5 | 5 | 5 |
| New Zealand | 5 | 5 | 5 |
| BC Interior | 5 | 5 | 5 |
| Inland Empire | 5 | 5 | 5 |
| Ontario | 5 | 5 | 6 |
| Quebec | 6 | 6 | 6 |
| BC Coast | 6 | 6 | 6 |
| Atlantic Provinces | 6 | 6 | 6 |
| US North | 6 | 6 | 6 |
| Sweden | 7 | 8 | 8 |
| Finland | 8 | 9 | 9 |
| Japan | 10 | 10 | 10 |

In summary:

- Brazil and Chile will continue to be the most competitive on world markets in terms of the unbleached and bleached kraft pulp furnish cost as well as in each of these kraft based paper board products. This is largely because of their fibre and labour cost advantage, which more than offsets any transportation cost disadvantage.

- The overall competitiveness of all Canadian regions will decrease slightly in the years to come.

- The US regions will maintain their position because of the concentration of US mills in large sized, highly efficient, low cost machines (few new ones are being built) and their cost competitiveness in softwood fibre.

- Conditions in New Zealand will remain about constant except for labour costs, which are expected to increase. These, however, are not expected to offset the fibre cost advantage expected for New Zealand in the years ahead. Given that the position of the BC Interior and the Prairies will deteriorate, New Zealand will gain in relative competitiveness with the other regions.

- The relative positions of Sweden, Finland and Japan are not expected to improve. Accordingly, these regions are expected to remain the least competitive of all producing regions in terms of each of these products, as well as BKP production.

## REGIONAL SUMMARY

This section of the report summarizes the pulp and paper products selected for analysis in the previous section from the viewpoint of the individual Canadian regions. The purpose of this summary is to rank these products on which, based on the key cost elements of labour, energy, and furnish materials, the individual Canadian regions are likely to focus their attention. Again, the reader is referred to Volume I for discussion of other factors which determine investment in new or incremental capacity.

The products are divided into three categories: (A) most competitive, (B) average competitive, and (C) least competitive, assuming the competitive factor 5 (as presented in the previous analysis) is representative of the average for each of the years 1987, 1995 and 2010 respectively. Products with lower factors are considered most competitive and higher factors are considered least competitive.

Thus, where it is possible to influence product choice these rankings should prove a useful guide. Nevertheless, as has already been discussed there are many more factors to take into account in selecting products for manufacture - such as availability of markets, capital availability, other products, and many of the special circumstances that make each investment decision unique.

### Atlantic Provinces

The product summary for the Atlantic provinces reveals the following:

**COMPETITIVENESS OF THE ATLANTIC PROVINCES**

| Most Competitive | Average | Least Competitive |
|---|---|---|
| Coated FS | LWC | Newsprint |
| | SC | CTMP - (S) |
| | Uncoated FS | - (H) |
| | | Linerboards |
| | | Market Pulp - (S) |
| | | Market Pulp - (H) |

The above summary suggests that relatively, the Atlantic provinces can produce coated freesheet quite competitively mainly because of its lower wage rates. Also, it can be an average cost producer of lightweight coated papers, supercalendered papers and uncoated papers; in other words, the higher value added papers.

With their high power and fibre costs, the Atlantic provinces are relatively less competitive in the manufacture of market BKP pulp, CTMP pulp, standard newsprint or linerboards. For cost reasons alone, with existing technology, significant expansion in these grades is unlikely since costs are expected to increase even further.

Quebec

Quebec is potentially quite competitive in a number of product areas as shown in the following summary:

COMPETITIVENESS OF QUEBEC

| Most Competitive | Average | Least Competitive |
|---|---|---|
| CTMP - (H) | Newsprint | Market Pulp - (H) |
| CTMP - (S) | SC | Market Pulp - (S) |
| Coated FS | Uncoated FS | Linerboards |
| LWC | | |

The low power costs make Quebec particularly attractive for the manufacture of both hardwood and softwood CTMP, as the above table shows. It is also reasonably competitive in commodity grades of lightweight coated papers and coated freesheet because of its lower labour and filler costs. It will continue to be competitive in newsprint, supercalendered and uncoated papers.

Quebec's principal competitors for United States markets are and will continue to be the US South, Ontario and the Prairies. In CTMP and coated freesheet, Quebec should improve its competitive cost position over Ontario and the US South towards the end of the study period.

In the European market, Spain, Portugal, the US South and South America are the principal competition or potential competition but Quebec has a clear advantage in CTMP over the US South and European producers due to its low cost power policy which offsets the geographic advantage enjoyed by Spain and Portugal. Quebec also enjoys a slight advantage in lightweight coated papers.

## Ontario

Ontario is cost competitive in a wide range of grades. Even though almost all products fall into the average cost category, very few are significantly worse than average. Our analysis shows that only hardwood CTMP and coated freesheet are significantly more competitive than average and that market bleached kraft pulp and linerboard are less competitive.

**COMPETITIVENESS OF ONTARIO**

| Most Competitive | Average | Least Competitive |
|---|---|---|
| CTMP - (H) | Newsprint | Linerboard |
| Coated FS | CTMP - (S) | Market Pulp - (H) |
| | LWC | Market Pulp - (S) |
| | SC | |
| | Uncoated FS | |

Ontario's position as an average cost producer, therefore, is a mixed blessing. In difficult economic times it can be severely undercut by low cost producers such as its Prairie neighbours, the US South and South America, which all have modern, large scale, efficient mills. To stay competitive in this situation, and to capitalize on the large and expanding US market, Ontario should take a leading position in technology and product research and ensure, like the Scandinavians, that its pulp and paper mills are technologically up to date, that their quality is excellent and that companies are able to take full advantage of economies of scale.

Ontario pulp and paper mills currently are less than world scale, older, and are not as efficient as they could be. Ontario companies must modernize their mills to become competitive. If they do not, companies will see their profitability and cash flow diminish and this in turn will make it more difficult for them to raise the very substantial sums required to fund modernization.

## Prairies

The Prairie region is the lowest cost producing area in North America. The following table shows that, on the basis of the major cost components considered, it is capable of producing most pulp and paper products on a competitive basis. Of course, this does not necessarily imply that all these products could be produced profitably. Recent history has shown that special incentives may be required in order to achieve major investments.

**COMPETITIVENESS OF THE PRAIRIES**

| Most Competitive | Average | Least Competitive |
|---|---|---|
| CTMP - (S) | Coated FS | Market Pulp - (H) |
| CTMP - (H) | | |
| Newsprint | | |
| LWC | | |
| SC | | |
| Uncoated FS | | |
| Market Pulp (S) | | |
| Linerboard | | |

Distance from tidewater and large centres of population means that this region has high delivery costs. Nevertheless, its highly competitive fibre and energy costs coupled with modern, large scale, technologically efficient plants should permit the Prairies, and particularly Alberta to compete virtually world-wide for many years. Only South America is more cost competitive than the Prairies but, it is also faced with the problem of potentially attractive variable costs and high capital costs for infrastructure development. In the case of the Prairies costs, particularly for fibre, are expected to rise comparatively after the Year 2000 to levels more similar to those which will be experienced in the BC Interior.

## British Columbia Interior

The BC Interior currently produces mainly softwood market BKP pulp and some CTMP pulp. There is a very small amount of kraft paper manufactured but a newsprint machine currently is being installed. The following table shows that the BC Interior, with its reasonable fibre and energy costs, is particularly competitive in newsprint and CTMP.

**COMPETITIVENESS OF THE BRITISH COLUMBIA INTERIOR**

| Most Competitive | Average | Least Competitive |
|---|---|---|
| Newsprint | Market Pulp - (S) | Market Pulp - (H) |
| CTMP - (S) | Coated FS | |
| CTMP - (H) | Linerboard | |
| SC | LWC | |
| Uncoated FS | | |

The table also shows that the BC Interior is well situated to move into the manufacture of such higher value added products as supercalendered papers and freesheets. It can continue to be competitive in softwood bleach kraft pulp but the existing, relatively old mills are being overtaken by mills elsewhere in terms of size and efficiency, particularly energy efficiency and co-generation, indicating a need for substantial upgrading. The BC Interior would also be competitive in the manufacture of coated freesheet, LWC and linerboards.

Like the Prairies, the BC Interior is at a competitive disadvantage from a freight viewpoint owing to distances from tidewater which add about $20 per tonne to delivered costs as compared to the BC Coast. Adoption of alkaline paper making processes would permit cost competitive manufacture of certain paper grades if local lime deposits are proven to be of adequate quality and the need to import clays could be avoided.

**British Columbia Coast**

The BC Coast has certain similarities to Ontario. The undernoted table shows that it is basically an average cost region for the manufacture of newsprint and paper grades and can be regarded as being reasonably competitive in this respect. It is an increasingly higher cost region for the manufacture of market BKP but, with relatively low cost energy, highly competitive in the manufacture of CTMP.

**COMPETITIVENESS OF THE BC COAST**

| Most Competitive | Average | Least Competitive |
|---|---|---|
| CTMP - (S) | Newsprint | Market Pulp - (H) |
| CTMP - (H) | LWC | Market Pulp - (S) |
| | SC | Linerboards |
| | Uncoated FS | |
| | Coated FS | |

The BC Coast has a cost structure quite similar to the US West and Inland Empire regions, with which it competes for North American markets. However, like the US West it has the advantage of having its mills located on tidewater with related lower freight costs.

Thus, like Ontario, to compete in the same markets as US producing regions it has to look for technological superiority. At present BC Coast mills are relatively small and old. A number of projects have been initiated to redress this problem but much remains to be done. With the inherent and increasing cost disadvantage the BC Coast should phase out of the production of significant quantities of market BKP and focus on CTMP and higher value added papers, perhaps at existing mill sites and in conjunction with upgraded capacity in kraft pulping. Products such as mechanical pulp based papers, (incorporating kraft pulp), and possibly multi-layer board, while still producing a proportion of kraft market pulps and newsprint, are examples of the type of product-mix likely to characterise new investment over the next twenty years or so.

## GLOSSARY OF TERMS

| | |
|---|---|
| ADMT | Air dry metric ton |
| BCTMP | Bleached chemi-thermomechanical pulp |
| BDMT | Bone dry metric ton |
| BK | Bleached kraft |
| BKP | Bleached kraft pulp |
| Boxboard | Relatively thick solid paperboard used in folding box manufacture. |
| Chemical Pulp | The mass of fibres resulting from the reduction of wood or other fibrous raw material into its component parts during the cooking phases with various chemical liquors, in such processes as sulphate, sulphite, soda, NSSC, etc. |
| Chips | Pieces of wood (approximately 1 inch square and 1/8 inch thick) resulting from the cutting of pulpwood logs |
| Coated Paper | A term applied to any type of paper whose surface has been treated in such a way as to apply a coating in order to enhance its finish characteristics |
| Co-generation | Generation of power in an industrial power plant to produce both steam and electricity for in-plant use, as well as for sale to outside utility companies |
| Commodity Grade | A standard grading of lumber widely traded and appropriate for use in many applications |
| CTMP | Chemi-thermomechanical pulp |
| Economy of scale | Economically sized mill, achieving the lowest average cost per unit of production in relation to discrete major items of capital equipment. |
| FSAC | Forest Service Advisory Council |
| Fibre | Structural component of woody plants |
| Filler | A substance added to the pulp stock to fill the spaces between fibres and enhance the printing properties of the paper made from it. |

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|---|---|
| Freesheet | Bleached printing and writing papers containing not more than 10% groundwood or other mechanical pulps in their furnish |
| FS | Freesheet |
| Furnish | The various components, comprising pulps, additives, fillers and extenders, used in papermaking. |
| GATT | General Agreement on Trade and Tariffs. |
| Greenfield | A new mill including all facilities and costs. |
| H | Hardwood |
| hardwood | Wood from non-coniferous trees |
| Iberian Peninsula | Spain and Portugal |
| Integrated paper mill | A mill with pulping facilities connected to a paper machine. |
| Kraft (pulp) | Means "strength" in German; the term commonly used as a name for sulphate chemical pulp. |
| Linerboard | Unbleached kraft paperboard manufactured for use as facing material when combining paperboard for conversion into corrugated or solid fibre boxes. |
| LWC | Lightweight coated paper (less than 60 $g/m^2$). |
| Market Pulp | Any pulp manufactured by a pulp mill and sold on the open market as a product. |
| Mechanical Pulp | Fine textured, usually bright pulps used in paper and paperboard manufacture and produced by mechanical rather than chemical processes. |
| MWh | Megawatt hour |
| RISI | Resource Information Systems, Inc. |
| Roundwood | Wood delivered to a pulp mill in log form, with or without bark attached and cut to specified lengths or in whole log lengths. |
| S | Softwood |
| SC | Supercalendered |

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|---|---|
| Scandinavia | Finland, Norway, Sweden |
| Softwood | Wood from coniferous trees |
| Stumpage | The fee paid by tenure holders for timber cut on Crown lands |
| Supercalendered Paper | Paper whose surface finish has a higher-than-normal glaze obtained by passing it between a series of alternating arranged metal and cotton or paper-covered rolls under pressure on a paper process machine called a supercalender |
| Testliner | Linerboard produced from secondary fibre. |
| Uncoated Freesheet | Grades of paper made up of essentially all chemical pulp with no mechanical pulp and without any applied sheet coating material |
| White Top Liner | Linerboard with a top coating of bleached kraft pulp |
| Woodfree (paper) | See freesheet |
| WRA | Woodbridge, Reed and Associates |